

Table of Contents

1.0 SCIENCE REQUIREMENTS AND MISSION SCIENCE PERFORMANCE	1
1.1 TRIP Executive Summary	1
1.1.1 Foldout Walkthrough	2
1.2 Science and Mission Requirements	2
1.2.1 Science Objectives and Derived Science Requirements	2
1.2.2 Investigations	4
1.2.3 Measurement Capabilities	6
1.2.4 Measurement Goals	7
1.2.5 Measurements and Data	7
1.3 Mission Science Performance and Design	7
1.3.1 Instrumentation	7
1.3.1.1 SXT Flight Mirror Assembly	9
1.3.1.2 Reflection Grating Spectrometer	12
1.3.1.3 X-ray Microcalorimeter Spectrometer	14
1.3.1.4 Hard X-ray Telescope	18
1.3.2 Mission Approach	20
2.0 MISSION IMPLEMENTATION PLAN	21
2.1 Mission Approach	21
2.2 Launch, Trajectory, and Orbit Characteristics	21
2.2.1 Launch	21
2.2.2 Trajectory and Orbit	21
2.3 Operations Concept	21
2.3.1 Operations Development	24
2.3.2 Launch and Early Orbit	24
2.3.3 Normal Operations	24
2.3.4 Calibration	25
2.3.5 Constellation Management	25
2.3.6 Staffing	26
2.4 Mission Architecture	26
2.4.1 Flight Segment/Observatory Concept	26
2.4.1.1 Telescope Module	26
2.4.1.2 Spacecraft Bus	28
2.4.1.3 Resources	31
2.4.2 Ground Segment Architecture	31
2.4.3 Data Validation, Analysis, and Archiving	34
2.5 Approach to Mission Success	36
2.5.1 Heritage and Maturity of Mission Elements	36
2.5.2 Redundancy and Reliability Measures	36
2.5.3 Integration and Test	37
2.5.4 Contamination Control	37
2.5.5 Product Assurance Activities	37
2.5.6 Systems Engineering	38
2.5.7 Equipment and Facilities	39
3.0 TECHNOLOGY ROADMAP AND PROGRAM FORMULATION	41
3.1 Technology Readiness and Development	41
3.1.1 SXT Mirror Technology Readiness and Development Plans	42
3.1.1.1 SXT Mirror Technology Readiness	42
3.1.1.2 SXT Mirror Technology Development Plan	44
3.1.1.3 Key Risks and Mitigation	48
3.1.2 Grating Technology Readiness and Development Plans	48
3.1.2.1 Grating Technology Readiness	48
3.1.2.2 Grating Technology Development Plan	49
3.1.2.3 Key Risks and Mitigations	51
3.1.3 CCD Technology Readiness and Development Plans	51
3.1.3.1 CCD Technology Readiness	51
3.1.3.2 CCD Technology Development Plan	51

Table of Contents

3.1.3.3 Key Risks and Mitigations	52
3.1.4 X-ray Microcalorimeter Technology Readiness and Development Plans	53
3.1.4.1 Microcalorimeter Technology Readiness	53
3.1.4.2 Microcalorimeter Technology Development Plan	53
3.1.4.3 Key Risks and Mitigation	56
3.1.5 ADR Technology Readiness and Development Plan	57
3.1.5.1 ADR Technology Readiness	57
3.1.5.2 ADR Technology Development Plan	58
3.1.5.3 Key Risks and Mitigation	58
3.1.6 Cryocooler Technology Readiness and Development Plans	59
3.1.6.1 Cryocooler Technology Readiness	59
3.1.6.2 Cryocooler Technology Development Plan	59
3.1.6.3 Key Risks and Mitigation	60
3.1.7 Hard X-ray Telescope Mirror Technology Readiness and Development Plans	60
3.1.7.1 HXT Mirror Technology Readiness	60
3.1.7.2 HXT Mirror Technology Development Plan	61
3.1.8 HXT Detector Technology Readiness and Development Plans	62
3.1.8.1 HXT Detector Technology Readiness	62
3.1.8.2 HXT Detector Technology Development Plan	62
3.1.8.3 Key Risks and Mitigations	63
3.2 Other Program Formulation Activities	63
4.0 MANAGEMENT, SCHEDULE, AND BUDGET	66
4.1 Management	66
4.1.1 Mission Formulation	66
4.1.1.1 Organization	66
4.1.1.2 Teaming Arrangement and Institutional Commitments	67
4.1.1.3 Decision-Making Process	69
4.1.1.4 Responsibilities and Experience of Team Members	69
4.1.1.5 Technology Development Management	70
4.1.1.6 Mission Architecture Development	71
4.1.1.7 Risk Management	72
4.1.1.8 Transition from Technology Program to Flight Project	72
4.1.2 Mission Implementation	75
4.1.2.1 Organization	75
4.1.2.2 Teaming Arrangement and Institutional Commitments	75
4.1.2.3 Decision-Making Process	76
4.1.2.4 Responsibilities and Experience of Team Members	76
4.1.2.5 Instrument Development Management	76
4.1.2.6 Mission Elements Management	76
4.1.2.7 Risk Management	77
4.1.2.8 Management of Reserves	77
4.2 Schedule	78
4.3 Budget	79
4.3.1 Mission Formulation Phase	80
4.3.2 Mission Implementation Phase	80
4.3.3 Summary Budget	80
4.3.4 Cost of NASA and Partner Participation	80
4.3.5 Methodology for the Budget	80
4.3.6 Budget Reserves	82
4.3.7 Budget Confidence	82
Appendix A - Detailed Budget	A-1
Appendix B - Supporting Detailed Schedules	B-1
Appendix C - Draft International Participation	C-1
Appendix D - Outline of Technical Responsibilities for International Partners	D-1
Appendix E - Abbreviations and Acronyms	E-1
Appendix F - References	F-1